

form of the bill and feet are similar to those of the genus proposed above.

The specimen of *Caulodromus* was kindly lent me by J. R. Grace, Esq., who procured it in Darjeeling : that of *Salpornis* was presented by B. H. Hodgson, Esq. to the British Museum, and forms part of a collection from Behar.

MISCELLANEOUS.

Microscopic Anatomy of the Shell of the Decapodous Crustacea.

By J. LAVALLE.

FROM my observations, says the author, the tegumentary apparatus of the *Crustacea* may be divided into two parts : 1st, an exterior one, which is incrustated with calcareous salts, and has no apparent vessels ; it is the carapace, the shell properly so called ; it alone forms the solid skeleton of the animal, and its inextensibility requires it to be shed at certain periods, to be replaced by a larger covering. 2nd, the other, situated in the interior, covers the first at all points : it is soft and highly vascular, it remains after the shedding of the tegument, and appears to be especially destined to reproduce a new one.

My observations apply to the shell alone, to that portion of the tegumentary apparatus which is cast annually, and I have purposely limited the subject, because it has been hitherto almost impossible to base a sufficiently settled opinion upon the nature of this coriaceous and hardened covering.

The solid portion of the tegumentary apparatus of the decapodous *Crustacea* which is shed differs essentially from shells, in one thing, that when treated with an acid it parts with its carbonate of lime without its organization being any way changed. In this respect it may be compared to the bones of the vertebrate animals.

The shell constitutes a covering of a single piece, continuous throughout, and which is only interrupted on the level of the natural openings. The flexible points, and the softest parts of this envelope differ from the solid parts only in the absence of calcareous salts ; their organization is perfectly identical. The articulations are only more or less complicated, but often very simple folds, of this covering. It is the same with the ossiform parts placed withinside the organs, and designed for the insertion of the locomotor muscles. The parts destined to break or grind the food are only more solid parts of the shell and of a denser texture. At the time of shedding, all these parts are cast off together. The shell presents, in the most perfect state, three layers quite distinct and easily separable :—The most external, homogeneous, transparent and corneous one, presents an opening only for the passage of the hairs or analogous organs, and covers the whole shell with a varnish often extremely thin ; it is evidently analogous to the epidermis of the higher animals ; I have designated it by the name of *epidermal layer*. The central layer is

especially destined to contain the colouring matter of the shell ; it has a peculiar organization, and always contains the base of the hairs and the corneous tubercles : this is the *pigmental layer*. The internal layer is much the thickest, and constitutes nearly the whole shell ; in it are found the passages of the hairs, tubercles and spines, as well as a great number of small irregular bodies of an organic nature : this is the *dermal layer*.

These two last layers are the only ones in which the carbonate of lime is deposited ; they have a nearly analogous organization. Under a weak magnifier, we ascertain that they are formed throughout of extremely fine and delicate lines, whose general and striking characteristic is that they are constantly parallel. This organization exists in the great majority of cases, and we remark that, when it is absent, or difficult to detect, the dermal layer presents iridescent tints, often as brilliant as those of the most beautiful shells (the *Anomouri*). These lines are not produced by independent and superposed layers, for the shell is not separable into laminæ corresponding to these lines. By means of a very high magnifying power we can perceive that these lines form part of one whole. The intimate organization of the shell therefore presents itself under three principal forms : 1st, we only find extremely thin filaments, joined to one another and directed from within outwards, perpendicularly to the surface ; these filaments, becoming thicker and more opaque at similar levels, give an appearance of parallel lines : 2nd, these filaments exist, but are traversed at right angles and along parallel zones, by other bundles of filaments ; from these last issue ramifications which anastomose with the adjacent zones and thus reunite all the bundles : 3rd, the perpendicular filaments no longer exist, and we only meet with parallel bands, from which issue very irregular ramifications which unite with the adjacent bands.

The hairs of the decapodous *Crustacea* are simple or barbed ; they never have barbules. They are not a prolongation of the epidermal layer ; they are always in communication with the interior of the shell by a canal which traverses in a straight line the thickness of the carapace, and which is one while empty and at another filled with a matter similar to that which exists in the interior of the hairs. They all have a central canal filled with a marrow analogous to that which is found in the hairs of the higher animals. They all grow from a rounded part, which has the greatest analogy with bulbs. These sorts of bulbs are always situated in the pigmental layer. The irregular bodies which cover certain *Crustacea*, and in particular *Pisa tetradon*, are only hairs, the barbs of which are coherent.

The spines of the decapodous *Crustacea* appear to be continued in the epidermal layer, with which they have the greatest analogy in appearance and composition. We find in them a very considerable number of small canals analogous to those of the hairs, and which, like the last, traverse the whole shell to reach the spine.

With respect to the tubercles often found in the pigmental layer, and each of which has a small canal by means of which they communicate with the interior of the shell, we can only consider them as

organs analogous to the bulbs which are found at the base of the hairs.

I shall here only observe further, that my investigations seem to be in complete opposition to the theories which make the shell of the *Crustacea* analogous* to the scaly epidermis of serpents and lizards. I see no analogy between the shedding of the shell of the *Crustacea*,—which divests them of organs destined to give the body its form and volume, to serve as points of attachment to the locomotor muscles, to furnish the instruments of prehension and mastication; organs placed not only on the surface of the body, but often immersed in the midst of the soft parts, and in which we find an organization such as I have described,—and the periodical shedding observed in reptiles of a thin epidermis, without consistency, completely inorganized and incapable of fulfilling any of the uses to which the shell is destined.

My researches have convinced me of the vitality of the shell, at least in the first period of its existence; and in reference to this, I am fully of Cuvier's opinion, when he said, in his '*Anatomie Comparée*,' "The envelope of the *Crustacea* is at first soft, sensible, and even furnished with vessels; but a quantity of calcareous molecules soon collect there, harden it, and obstruct the pores and vessels."

Such was also the decided opinion of Dugés†.—*Comptes Rendus*, Jan. 4, 1847.

THE TEA PLANT OF CHINA.

There are few subjects connected with the vegetable kingdom which have attracted such a large share of public notice as the tea-plant of China. Its cultivation on the Chinese hills, the particular species or variety which produces the black and green teas of commerce, and the method of preparing the leaves, have always been objects of peculiar interest. The jealousy of the Chinese government in former times prevented foreigners from visiting any of the districts where tea is cultivated; and the information derived from the Chinese merchants, even scanty as it was, was not to be depended upon. And hence we find our English authors contradicting each other; some asserting that the black and green teas are produced by the same variety, and that the difference in colour is the result of a different mode of preparation; while others say that the black teas are produced from the plant called by botanists *Thea Bohea*, and the green from *Thea viridis*, both of which we have had for many years in our gardens in England. During my travels in China since the last war, I have had frequent opportunities of inspecting some extensive tea districts in the black and green-tea countries of Canton, Fokien, and Chekiang, and the result of these observations is now laid be-

* The reader will see the need of the term *homologous*, signifying 'answerable part or namesake,' proposed by Professor Owen; as the shell of the *Crustacea* is 'analogous' to the scaly epidermis of serpents and lizards, inasmuch as it has a similar relation to the protection of the surface of the body.

† See Dr. Schmidt's important researches on this subject in Taylor's '*Scientific Memoirs*,' Part XVII.

fore the reader. It will prove that even those who have had the best means of judging have been deceived, and that the greater part of the black and green teas which are brought yearly from China to Europe and America are obtained from the same species or variety, namely, from the *Thea viridis*. Dried specimens of this plant were prepared in the districts I have named by myself, and are now in the herbarium of the Horticultural Society of London, so that there can be no longer any doubt upon the subject. In various parts of the Canton province, where I had an opportunity of seeing tea cultivated, the species proved to be the *Thea Bohea*, or what is commonly called the black-tea plant. In the green-tea districts of the north—I allude more particularly to the province of Chekiang—I never met with a single plant of this species, which is so common in the fields and gardens near Canton. All the plants in the green-tea country near Ning-po, on the islands of the Chusan Archipelago, and in every part of the province which I had an opportunity of visiting, proved, without exception, to be the *Thea viridis*. Two hundred miles further to the north-west, in the province of Kiang-nan, and only a short distance from the tea hills in that quarter, I also found in gardens this same species of tea. Thus far my actual observation exactly verified the opinions I had formed on the subject before I left England, viz. that the black teas were prepared from the *Thea Bohea* and the green from *Thea viridis*. When I left the north, on my way to the city of Foo-chow-foo, on the river Min, in the province of Fokien, I had no doubt that I should find the tea hills there covered with the other species, *Thea Bohea*, from which we generally suppose the black teas are made; and this was the more likely to be the case as this species actually derives its specific name from the Bohee hills in this province. Great was my surprise to find all the plants on the tea hills near Foo-chow exactly the same as those in the green-tea districts of the north. Here were, then, green-tea plantations on the black-tea hills, and not a single plant of the *Thea Bohea* to be seen. Moreover, at the time of my visit, the natives were busily employed in the manufacture of black teas. Although the specific differences of the tea-plants were well-known to me, I was so much surprised, and I may add amused, at this discovery, that I procured a set of specimens for the herbarium, and also dug up a living plant, which I took northward to Chekiang. On comparing it with those which grow on the green-tea hills, no difference whatever was observed. It appears, therefore, that the black and green teas of the northern districts of China (those districts in which the greater part of the teas for the foreign markets are made) are both produced from the same variety, and that that variety is the *Thea viridis*, or what is commonly called the green-tea plant. On the other hand, those black and green teas which are manufactured in considerable quantities in the vicinity of Canton are obtained from the *Thea Bohea*, or black tea. * * *

In the green-tea districts of Chekiang near Ning-po, the first crop of leaves is generally gathered about the middle of April. This consists of the young leaf-buds just as they begin to unfold, and

forms a fine and delicate kind of young hyson, which is held in high estimation by the natives, and is generally sent about in small quantities as presents to their friends. It is a scarce and expensive article, and the picking of the leaves in such a young state does considerable injury to the tea-plantations. The summer rains, however, which fall copiously about this season, moisten the earth and air; and if the plants are young and vigorous, they soon push out fresh leaves. In a fortnight or three weeks from the time of the first picking, or about the beginning of May, the shrubs are again covered with fresh leaves, and are ready for the second gathering, which is, in fact, the most important of the season. The third and last gathering, which takes place as soon as new leaves are formed, produces a very inferior kind of tea, which, I believe, is rarely sent out of the district. The mode of gathering and preparing the leaves of the tea-plants is extremely simple. We have been so long accustomed to magnify and mystify everything relating to the Chinese, that in all their arts and manufactures we expect to find some peculiar and out-of-the-way practice, when the fact is, that many operations in China are more simple in their character than in most other parts of the world. To rightly understand the process of rolling and drying the leaves, which I am about to describe, it must be borne in mind that the grand object is to expel the moisture, and at the same time to retain as much as possible of the aromatic and other desirable secretions of the species. The system adopted to attain this end is as simple as it is efficacious. In the harvest seasons the natives are seen in little family groups on the side of every hill, when the weather is dry, engaged in gathering the tea-leaves. They do not seem so particular as I imagined they would have been in this operation, but strip the leaves off rapidly and promiscuously, and throw them all into round baskets made for the purpose out of split bamboo or rattan. In the beginning of May, when the principal gathering takes place, the young seed-vessels are about as large as peas. These are also stripped off and dried with the leaves; it is these seed-vessels which we often see in our tea, and which have some slight resemblance to young capers. When a sufficient quantity of leaves are gathered, they are carried home to the cottage or barn, where the operation of drying is performed.

This is minutely described, and the author continues:—

I have stated that the plants grown in the district of Chekiang produce green teas, but it must not be supposed that they are the green teas which are exported to England. The leaf has a much more natural colour, and has little or none of what we call the 'beautiful bloom' upon it, which is so much admired in Europe and America. There is now no doubt that all these 'blooming' green teas which are manufactured at Canton, are dyed with prussian blue and gypsum, to suit the taste of the foreign 'barbarians': indeed, the process may be seen any day, during the season, by those who will give themselves the trouble to seek after it. It is very likely that the same ingredients are also used in dyeing the northern green teas for the foreign market; of this, however, I am not quite certain. There is

a vegetable dye obtained from *Isatis indigotica* much used in the northern districts, and called *Tein-ching*; and it is not unlikely that it may be the substance which is employed. The Chinese never use these dyed teas themselves, and I certainly think their taste in this respect is more correct than ours. It is not to be supposed that the dye used can produce any very bad effects upon the consumer, for, had this been the case, it would have been discovered before now; but if entirely harmless or inert, its being so must be ascribed to the very small quantity which is employed in the manufacture.

In short, the black and green teas, which generally come to England from the northern provinces of China, are made from the same species; and the difference of colour, flavour, &c. is solely the result of the different modes of preparation.—*From Mr. Fortune's 'China.'*

Description of two new species of Shells. By WILLIAM CASE.

Helix annulata. Shell minute, much depressed—umbilicus showing all the volutions; aperture simple and somewhat oval; whorls four, banded by thin, sharp and parallel ribs, inclining slightly forward; intercostal space marked with wavy lines, running parallel with the whorls; nearly transparent; diameter about one line.

This minute but beautiful shell was found by Captain B. A. Stanard, in the region about Lake Superior, and I have heard of its being observed in other places, but so far as I can learn, it is undescribed. It differs from any description of the *pulchella* I have yet met with, in having uniformly an oval aperture and simple lip. The *H. minuta* of Say, I believe never has the parallel ribs, and is supplied with a lip.

Planorbis multivolvis. Shell about five-eighths of an inch in diameter; whorls seven, about half of the last whorl overlapping the preceding one, sometimes the last whorl suddenly distorted and expanded for the last half of its length; right side concave, left side slightly acuminate and considerably carinate; throat campanulate; aperture opening towards the left, but projecting on both sides beyond the preceding whorl.

This shell also I obtained from Captain Stanard, who found it in the northern part of Michigan. It is very distinct from any *Planorbis* I have met with, or have been able to find any description of. I have named it from its strong characteristic—a greater number of whorls than usual in the genus.

Note.—The *Helix* here described approaches the *pulchella*, (*minuta* of Say,) a ribbed variety of which is called *H. costata*; yet it appears to be a distinct species. The *Planorbis* is most nearly allied to the *P. campanulatus*.—A. A. G.—*Silliman's American Journal*, Jan. 1847.

TRICHINA SPIRALIS.

Dr. Leidy stated, at a recent meeting of the Academy of Natural Sciences, Philadelphia, that he had lately detected the existence of an Entozoon in the superficial part of the extensor muscles of the thigh of a hog. The Entozoon is a minute, coiled worm, contained